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Breast and Cervical Cancer Screening in Virginia: The Impact of Insurance Coverage and the Every Woman's Life Screening Program

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Abstract

Background: Screening for breast and cervical cancers is important because early detection increases cancer survival. Since 1991, the U.S. government has helped finance a national early detection program for breast and cervical cancer among uninsured low-income women, known in Virginia (VA) as Every Woman's Life (EWL).

Objectives: This study aims to determine whether there are differences in the prevalence of breast and cervical cancer screening based on insurance coverage, assess the prevalence of screening by health district, and evaluate the ability of EWL to effectively reach its target population.

Methods: Cross-sectional data from the 2005 Behavioral Risk Factor Surveillance System survey were analyzed. Using population weights, descriptive statistics were generated and multiple regression was performed to assess the association between insurance coverage and screening prevalence among VA women 40 to 64 years of age (n=1,627). Adjusted screening prevalence by health district was also calculated. EWL client (n=4,959) and provider data from the VA Department of Health was obtained to create screening density maps with Geographic Information Systems.

Results: After adjustment, women with insurance were significantly more likely to have a mammogram within the last two years compared to those without insurance (78% vs. 50%, $p<0.0001$) and a pap smear in the last three years (89% vs. 66%, $p<0.0001$). Breast cancer screening per recommendations was lowest for Three Rivers Health District (52%) whereas cervical cancer screening per recommendations was lowest for the Cumberland Plateau Health District (56%). Several health districts did not contain adequate numbers of EWL screening and/or diagnostic provider sites.

Conclusion: The results of this study will be used to assist EWL in recruitment of additional screening and/or diagnostic sites in underserved areas of Virginia.

Background and Significance

Scope of the Problem

Although the causes and natural histories of breast and cervical cancer are different, both are important public health concerns. Breast cancer is the most commonly diagnosed non-melanoma skin cancer among women in the United States and second only to lung cancer as the leading cause of cancer-related disease. The American Cancer Society estimates that 178,480 new cases of breast cancer will be diagnosed in 2007. In Virginia, it is estimated that over 6,000 cases of breast cancer will be reported in 2007, and approximately 1,200 Virginian women will die from this disease. Cervical cancer, which is the third most common reproductive cancer, also remains a significant public health issue in the United States. Approximately 11,150 new cases of invasive cervical cancer will be diagnosed in 2007. In Virginia, it is estimated that 280 women will be diagnosed with cervical cancer (American Cancer Society 2007).

Screening Recommendations

Early diagnosis and treatment increases the likelihood of cancer survival, thus, screening for breast and cervical carcinomas has been widely accepted and practiced throughout the United States (Kerlikowske 1995; McCarthy 2000; Oluwole 2003). According to the American Cancer Society, the 5 year survival rates of breast and cervical cancer when diagnosed at the local stage are approximately 98% and 92% respectively (American Cancer Society 2007). Five-year survival rates decrease at later stages of diagnosis. Studies of the etiology of breast and cervical cancers have failed to identify feasible primary prevention strategies suitable for use in the general population. Thus, reducing mortality from breast and cervical cancers through early detection has become a high priority. The potential for reducing death rates from breast cancer is contingent on increasing mammography screening rates and subsequently detecting the disease

at an early stage. Effective control of cervical cancer depends primarily on early detection of precancerous lesions through the use of the Papanicolaou (Pap) test, followed by timely evaluation and treatment. The U.S. Preventive Services Task Force (USPSTF) recommends screening mammography, with or without clinical breast examination (CBE), every one to two years for women 40 years of age and older (USPSTF, 2005a). Cervical cancer screening should begin approximately three years after a woman begins having sexual intercourse, but no later than at 21 years old. The USPSTF recommends against routinely screening women older than age 65 for cervical cancer if they have had adequate recent screening with normal Pap smears and are not otherwise at high risk for cervical cancer (USPSTF, 2005b)

Healthy People 2010 offers national goals to eliminate health disparities and emphasized the federal government's commitment to facilitating the use of important cancer screening. The Healthy People 2010 report includes objectives relating to both breast and cervical cancer (US Department of Health and Human Services 2003). Specifically, Healthy People 2010 aims to increase the proportion of women 40 years of age and older who have ever received a mammogram to at least 80%, and to increase the proportion of women in this same age group who have received a mammogram within the preceding one to two years to at least 70%. According to the 2004 Behavioral Risk Factor Surveillance System (BRFSS), the most recent year of data collection, approximately 75% of women nationwide 40 years of age and older reported that they received a mammogram within the past two years (CDC 2006). Similarly, in 2004, roughly 74% of Virginia women 40 years of age and older reported receiving a mammogram within the past two years (CDC 2006).

The Healthy People 2010 objective relating to cervical cancer aims to increase the proportion of women aged 18 years of age and older with a uterine cervix who have ever

received a Pap smear to at least 97%, and to increase the proportion of women, meeting the same criteria, who have received a Pap smear within the preceding one to three years to 90%. According to 2004 BRFSS data, approximately 86% of women ages 18 years and older received a Pap test within the past three years. Within Virginia, approximately 87% of women ages 18 years and older reported that they received a Pap smear within the past three years (CDC 2006).

We are not currently meeting the cervical cancer screening objectives set forth in Healthy People 2010. Also, while some might argue that the breast cancer screening objectives of Health People 2010 are being met, it remains that approximately 26% of age-eligible women, those 40 years of age and older, are not being screened in Virginia.

Predictors of Screening

Previous studies have demonstrated that the burden of morbidity and mortality related to cancer falls disproportionately on underserved populations in the United States (Makuk 1999; Bradley 2001; Swan 2003). Several factors have been reported to be associated with screening. Disparities in use of cancer screening are related to differences in income, insurance, race, or ethnicity (Hiatt 2003). Predictors of use of cancer screening services include: having a regular source of care, physician recommendation, higher income, race, and higher levels of education (Selvin 2003; Breen 2001; Philips 1998; O'Malley 2002).

Studies have also demonstrated that women living in geographic isolation, such as rural areas, are less likely to have had a recent mammogram or Pap test compared to women living in urban areas (Coughlin 2002; Casey 2000; Schootman 1998; Hall 2002; Schoenberg 2005). For example, women residing in rural areas of the U.S. are screened for breast cancer at a significantly lower rate than women in urban areas: 66.7% vs. 75.4% (Coughlin 2002). Reasons that may account for the underutilization of preventive services by rural women may include

unavailability of services, lower education, inadequate health insurance, cultural barriers, and lower income levels (Philips 1998; Coughlin 2002; Casey 2000; Carruth 2006; Hall 2002).

Every Women's Life Program

To address disparities such as lower rates of cancer screening and early detection among underserved populations, The National Breast and Cervical Cancer Early Detection Program (NBCCEDP) was established by the U.S. Centers for Disease Control and Prevention (CDC) in the early 1990s. This program was created to provide breast and cervical cancer screening and diagnostic services to low income and uninsured women through cooperative agreements with state agencies. In Virginia, this program is officially known as the Virginia Breast and Cervical Cancer Early Detection Program (VABCCEDP), but, it is generally referred to as The Every Woman's Life Program (EWL). Established in 1996, this program operates under the Breast and Cervical Cancer Mortality Prevention Act of 1990, Public Law 101-354, which authorized the CDC to develop and implement a national program to ensure that eligible women receive regular screening and diagnostic testing for breast and cervical cancer. As part of this program, mammography and Pap smear screening tests are performed in accordance with current national recommendations. Federal funding covers screening and most diagnostic services, however, it does not include the cost of treatment. However, the Breast & Cervical Cancer Prevention and Treatment Act of 2001 allows women who have been enrolled and diagnosed with breast or cervical cancer by a contracted provider in EWL to be enrolled in the state Medicaid program for payment of treatment services.

EWL services are offered to women between the ages of 40 and 64 who meet federal income guidelines. Specifically, women must have annual household incomes that are no more than 200% of poverty level. Further, they have to be uninsured or underinsured. Results of breast

cancer screening among low-income and uninsured women enrolled in the NBCCEDP demonstrated the highest number of abnormal screening results in women aged 50 years or more (Eheman 2006). Therefore, the CDC requires that the majority of patients enrolled through the EWL be between the ages of 50 and 64.

To our knowledge, no research has been conducted to compare the prevalence of breast and cervical cancer screening in Virginia among uninsured and insured women or by health district to look for possible disparities in cancer screening across the state. Moreover, no previous research has used Geographic Information Systems (arcGIS) to visually display density mapping of breast and cervical cancer screening prevalence in Virginia. Thus, the objectives of this study are to (1) determine whether there are differences in the prevalence of breast and cervical cancer screening in Virginia based on insurance coverage, (2) assess the prevalence of screening by health district, and (3) evaluate the ability of EWL to effectively reach its target population by mapping EWL enrolled women in relation to EWL screening and diagnostic locations.

Methods

Data Collection and Study Sample

BRFSS

The data used in the current study were obtained from the 2005 Behavioral Risk Factor Surveillance System (BRFSS). BRFSS, which is funded by the Centers for Disease Control and Prevention (CDC), is an annual telephone-administered survey of non-institutionalized adults ages 18 years or older. Random-digit dialing techniques and multistage cluster sampling are utilized to sample adults and trained interviewers administer the questionnaire using a computer-assisted telephone interviewing software. All states must ask the core component questions

without modification. State data are pooled to produce nationally representative estimates. BRFSS defines eligible households as housing units that have a separate entrance, where occupants eat separately from other persons on the property, and that is occupied by its members as their principal or secondary place of residence. Non-eligible households are vacation homes, group homes, and institutions. Eligible household members include all related adults (aged 18 years or older), unrelated adults, roomers, and domestic workers who consider the household their home, even though they may not be home at the time of the call

The BRFSS survey included questions about general health status; demographic and socioeconomic characteristics; screening mammography; and Pap tests. Each female respondent was asked whether she had ever had a mammogram; participants who responded positively were then asked when they had received their last mammogram. Similar questions were asked concerning the Pap test. Women were also asked whether they had undergone a hysterectomy. The self-reported data in the BRFSS are used to derive annual mammography and Pap smear testing rates for women 40 to 64 years of age.

Sample

Overall, a total of 1,627 Virginia women between the ages of 40 and 64 years who completed the 2005 BRFSS survey were included in this study. We included this group because early detection is important in this age group and national screening recommendations exist. Also, this is the core age group covered by EWL. Women over the age of 64 were excluded from this study because approximately 96% of women age 65 and older are covered by Medicare and therefore, would not meet the eligibility criteria for EWL. Women were not excluded from the study sample based on any criteria other than age and residence. EWL client (n=4,959) and provider data from the VA Department of Health was also obtained.

Data Coding

The main outcome variables, breast and cervical cancer screening prevalence in Virginia, were dichotomized to those who were ever screened or not as well as those who were and were not screened per national recommendations (i.e. mammography in the last two years and Pap smear in the last three years).

The main independent variable, insurance status, was coded as a binary variable. Uninsured included those without insurance or "self-pay" whereas those with private insurance, military coverage or Medicaid were coded as having insurance.

Potential confounders included race, age, education, and income. Women over the age of 40 were separated into two groups: women 40-49 years of age and women 50-54 years of age. Race was grouped into three categories, "white," "black," and "other." Education was dichotomized into high school education or less and greater than high school education. Income status was grouped into two categories of less than $20,000 annual household income and greater than or equal to $20,000 annual household income.

Virginia county codes were taken from the 2005 BRFSS survey and collapsed into the thirty-five Virginia health districts according to information obtained from the Virginia Department of Health. Additionally, the zip codes for EWL clients/members were coded to correspond to the thirty-five Virginia health districts.

Statistical Analysis

SAS 9.1 software was utilized for all analyses. Cross-sectional data from the 2005 Behavioral Risk Factor Surveillance System survey was analyzed to assess the relationships between insurance status and breast and cervical cancer screening prevalence. Specifically, generalized linear mixed-model regression specifying a logit link function and a binomial

variance function (SAS PROC MIXED and SAS GLIMMIX) for the dichotomous variables was used (SAS, 1996). Given the probabilistic sampling scheme of the BRFSS survey, all analyses were weighted to avoid bias and to obtain population-based estimates. BRFSS data are directly weighted for the probability of selection of a telephone number, the number of adults in a household, and the number of telephones in a household. A final post-stratification adjustment is made for non-response and non-coverage of households without telephones. The weights for each relevant factor are multiplied together to get a final weight. Analyses of Pap smear use according to recommendations were limited to women aged 40 to 64 years of age who had not had a hysterectomy. However, no women were excluded from the "ever had Pap smear" analyses or either of the analyses on mammography screening rates. Unadjusted and adjusted rates of screening tests among insured and uninsured women were calculated. Further, overall adjusted rates of breast and cervical cancer screening per recommendation were calculated according to health district regardless of insurance status. Specifically, the adjusted rate of receiving mammography in the last two years and Pap smear in the last three years by health district was adjusted for age, race, education, income and insurance coverage.

Geographic Information System (GIS) was used to create prevalence maps of breast and cervical cancer screening rates per national recommendations by health district. In addition, screening density maps of breast and cervical cancer screening obtained by women through the EWL program as well as the locations of EWL screening and diagnostic sites were also plotted by health district. Specifically, the zip codes of active EWL clients/members were used to determine the number of women screened in various health districts in relation to the nearest EWL screening and diagnostic provider sites. Further, distance to travel to EWL participating provider sites was graphically displayed as 15-mile buffers surrounding the EWL provider sites.

Results

Our sample consisted of approximately 1,627 Virginia women aged 40-64 (Table 1). Of these women approximately 82.6% were non-Hispanic white and 14.2% were black. Most women (65.4%) had more than a high school education and an annual household income of greater than $20,000 (94.5%). The majority of women were also insured (89.8%).

Table 2 presents the unadjusted and adjusted breast and cervical cancer screening as well as screening rates per recommendation by insurance status. After adjustment approximately 76.8% of uninsured women reported they had ever received a mammogram compared to 92.5% of insured women (p-value <0.0001). The prevalence of women to ever receive a Pap smear was not statistically significant between uninsured (97.9%, 95% CI: 97.8, 99.8) and insured women (99.7%, 95% CI: 99.1, 99.9).

There was also a statistically significant difference between breast and cervical cancer screening per recommendations between uninsured and insured women. The prevalence of mammography screening in the past two years was 47.5% among uninsured women (95% CI: 42.1-57.9) and 79.3% among insured women (95% CI: 72.27, 83.1). The prevalence of cervical cancer screening in the past three years among uninsured women was 57.6% (95% CI: 60.0, 71.8) and 88.0% among insured women (95% CI: 85.2, 93.0).

Table 3 displays breast and cervical cancer screenings according to recommendations by health district regardless of insurance status. Mammography screening within the past two years was lowest in Lord Fairfax Health district (54.1%) and highest in Rappahannock/Rapidan Health District (74.0%). Cervical cancer screening per recommendations was lowest in the Peninsula Health District (63.4%) and highest in Richmond (84.5%).

Figure 1 is a graphical display of the findings reported in Table 3. Specifically, it shows the prevalence of having a mammogram in the last 2 years by health district. After adjustment, the prevalence of mammography ranged from 54.1% to 74.0% across the 35 Virginia health districts. In general, screening was higher in the past two years in health districts around the Hampton Roads area of Virginia. Health districts in Southwest Virginia, Central Virginia and part of the Eastern Shore had lower levels of breast cancer screening in the past two years.

Figure 2 shows the prevalence of having a Pap smear in the last 3 years by health district. After adjustment, the prevalence of cervical cancer screening ranged from 63.4% to 84.5% across the 35 Virginia health districts. In general, South-central Virginia health districts had higher Pap screening in the last three years. The Eastern Shore as well as the Southern Appalachian region of Virginia had lower rates of Pap screening.

Table 4 shows sample baseline characteristics of active EWL members in 2005. Of these women, most were white (56.4%), between the ages of 50-64 (85.8%), and spoke English (92.6%).

Figure 3 uses density mapping to demonstrate the distance traveled by enrolled EWL women to the nearest Pap screening location. Fifteen mile buffers surround each screening location. There are approximately 84 screening sites with unique zip codes. Health districts that appear to have adequate coverage based on EWL client density include Thomas Jefferson, Chesapeake, Portsmouth, West Piedmont, Lord Fairfax, and Central Shenandoah. Of note, certain health districts do not have any screening location despite the presence of at least one EWL client including, Loudon, Piedmont, Crater, and Three Rivers health districts. Other areas of Virginia that have higher areas of EWL density yet have only one provider site in a fifteen

mile area such as Lenowisco, Cumberland, Pittsylvania/Danville, and Mount Rogers health districts.

Figure 4 shows the distance traveled by EWL clients to the nearest diagnostic sites for cervical cancer. There are approximately 40 EWL cervical cancer diagnostic locations with unique zip codes. As indicated by the map, well-covered areas of the state include Rappahannock health district (with 3 diagnostic sites), and most areas of the eastern shore. Despite having a high EWL client density, the Lenowisco health district does not have any diagnostic provider. Other districts without an EWL cervical cancer diagnostic provider include Loudon, Piedmont, Central Virginia, and Alleghany health districts. A large number of health districts appear to have a minimal amount of diagnostic sites when considering the EWL client density. Central Shenandoah has one diagnostic site, yet at least fifteen women living in Rockbridge county must travel to a provider site in Augusta county or Botetour county to receive follow-up for an abnormal Pap site. Both of these locations are located outside of the 15 mile buffer driving distance. Women living in either Buchanan or Dickenson counties of the Cumberland health district must travel to either a diagnostic provider in Russell County or one in Tazewell County for abnormal Pap test follow-up. These locations are located outside of the 15 mile buffer distance.

Figure 5 depicts the distance traveled by enrolled EWL to the mammography screening locations. There are approximately 63 EWL mammography locations with unique zip codes. As indicated by the map, well-covered health districts based on EWL client density include Thomas Jefferson, Portsmouth, Central Virginia, and Pittsylvania. Health districts without at least one mammography site include Loudon, New River, Piedmont, and Crater. Areas that appear to be

underserved due to high numbers of EWL clients include Lenowisco, Cumberland, Mount Rogers, Rappahannock, and Lord Fairfax health districts.

Figure 6 shows the distance traveled by EWL clients to breast cancer diagnostic sites. There are approximately 50 diagnostic locations with unique zip codes. Well covered health districts include Portsmouth, Rappahannock, Mount Rogers, and Richmond City. Underserved health districts with at least one diagnostic site include Central Shenandoah, New River, Central Virginia, and Thomas Jefferson.

Discussion

Implications of Insurance Status

This project was designed to examine breast and cervical cancer screening in Virginia based on insurance status and geographic location and determine the efficacy of the EWL program. We found that 10.9% of Virginian women between the ages of 40-64% were uninsured in 2005. As expected, women without insurance had significantly lower rates of ever receiving a mammogram in their life, and lower rates of both breast and cervical cancer screening per national recommendations. This association persisted after adjustment. Thus, we are not meeting the breast and cervical cancer screening objectives of Healthy People 2010. As the number of uninsured Americans continues to grow, women may continue to go without needed preventive medical services, including screening.

These results are consistent with other studies demonstrating the vital role that health insurance plays in screening for breast and cervical cancer. Health insurance has been found to be a predictor of cancer screening when examined with other predictor variables as well as in studies when no association between screening and common risk factors (i.e. race, ethnicity) of cancer screening were found (Qureshi 2000). A recent study conducted by Litaker et al. found

that failure to complete high school, lower family income, absence of insurance and usual source of care were associated with reduced mammography screening among women between the ages of 50-69 (Litaker 2007). Specifically, 28.8% of women without health insurance reported they had received a mammogram in the past 12 months (p-value <0.001). Mammography screening in the study by Litaker and colleagues is much lower than mammography screening reported in this study (47.5%, 95% CI: 42.1, 57.9). However, our analysis included women screened within the past two years. Although we did not measure knowledge about screening locations, our study was similar to a multiethnic study conducted by Somkin and colleagues who found that regular breast and cervical cancer screenings were markedly below desired levels for women in five different racial/ethnic groups. Women with health insurance were more likely to receive a routine mammogram and Pap test with an OR of 1.88 and 2.37 respectively (Somkin 2004). These similarities to our study suggest that the impact of insurance has major effects on access to screening services. It is estimated that forty-six million Americans are uninsured, and an estimated 35 million Americans are underinsured. Many individuals find that they are too rich to qualify for Medicaid but do not make enough money to qualify for or afford private insurance.

Geographic Location

Breast and cervical cancer screening regardless of insurance status varied across the state (Figure 1 and 2). Many districts did not meet screening guidelines per recommendations. We expected to see lower screening rates in areas of the state that are designated as medically underserved. However, screening trends were not observed across the five geographic regions of the state (North, Northwest, Central, Southwest, Eastern). Surprisingly, Lord Fairfax health district had the lowest mammography screening rate in the past two years and was among the lowest Pap screening rate in the past three years. These results were different than historical

screening rates in this area. Common predictors of screening were included in our model, thus they should not affect the results of our analyses. One plausible explanation for low screening rates in Lord Fairfax is the small sample size of women who participated in the BRFSS study in that particular health district.

Every Woman's Life

Figures 3-6 demonstrate shortages of screening and diagnostic sites in areas of Virginia where EWL clients are located. A large amount of these provider shortages are located in designated "rural" areas of the state. For example, Lenowisco, Loudon, and Piedmont health districts show a consistent lack of providers across both types of screening and diagnostic tests. This is particularly troublesome in Lenowisco health district, which contains a significant amount of EWL clients. Lack of screening and provider sites may be explained in part by an overall lack of healthcare providers in certain areas of the state. According to a report to the U.S. Department of Health and Human Services – Health Resources and Services Administration (HRSA), over 13% of Virginia's population lives in areas that have been designated as health professional shortage areas, where they lack primary medical, dental, and mental health providers (HRSA, 2006). Forty-three Virginia counties and cities, (i.e. 32% of Virginia) are designated as medically underserved areas where there are shortages of health care providers, and have populations characterized by "low income, Medicaid-eligible, and cultural and/or linguistic access barriers" (VDH 2006). Of these 43 counties and cities, 35% are located in the Appalachia region, which is characterized by rural and geographically isolated communities that fare worse economically when compared to the rest of the nation as a whole.

As a result of these provider shortages, women enrolled in EWL are forced to travel considerable distances to receive services. This may translate into lower rates of screening and

diagnostic follow-up, especially among women living in rural areas of the state. For example, many rural regions are characterized by longer distances between medical facilities and less availability of health services, consequently limiting access to screening (Kreher 1995). However, one study found no significant difference in cancer detection rates between urban and rural residents (Blair 2006). Others have demonstrated that women living in geographic isolation, such as rural areas, are less likely than those living in urban areas to have had a recent mammogram or Pap smear (Coughlin 2002; Casey 2000; Schootman 1998; Hall 2002; Schoenberg 2005 Carruth 2006). Also, Engleman et al. found that increased distance from a permanent facility was significantly associated with decreased mammography rates (Engelman 2002). Marchick et al. also found a strong correlation between the number of mammography facilities and the population of a county, suggesting that women living in rural areas are less likely to have easy access to screening services (Marchick 2005). Our results were similar to Hall et al, who found that women living in the Appalachian region of the United States are more likely to have lower screening rates than the general population (Hall 2002). A recent study conducted by McElroy et al. used geographic information systems to identify geographic disparities in the early detection of breast cancer, to discover areas where increased mammography screening is needed, and to understand the diffusion of innovation in an urban or a rural setting. The results of this study demonstrated that mammography screening were not initially uniform across the state of Wisconsin, which was reflected in higher incidences of cancer diagnosed in situ in rural areas of the state (McElroy 2006).

Of note, the assessment of screening and diagnostic providers need in Virginia may be an underestimation of the true need among the EWL eligible population. Studies have demonstrated that although the NBCCEDP services have expanded since its creation in 1996, not

all women who are eligible to receive services are enrolled in the program. Lawson et al. found that federal funding for NBCCEDP has allowed only 12-15% of eligible women to be reached, meaning that more work needs to be done to ensure that all EWL eligible women are enrolled in the program (Lawson 2006). A recent study conducted by Tangka et al. examined the extent to which the NBCCEDP has helped to meet the mammography screening needs of low-income, uninsured women in 2002-2003 (Tangka 2006). Data obtained from the U.S. Census Bureau was used to estimate the number of women eligible to receive services and was compared to the number of women who actually received program funded mammograms. Results from the study demonstrated that approximately 4 million women between the ages of 40-64 were eligible to receive NBCCEDP services; however, only 13.2% received mammograms funded through the program (REF). Similarly, it is estimated that 55,000 women would be eligible for EWL in Virginia, however funding is only available to assist 5,000 obtain the breast and cervical cancer screening they need (VDH 2006).

Limitations

It is important to note several limitations when interpreting the results of this study. For example, this study was a population based cross-sectional study, thus, there are issues of temporality and causality can not be determined between insurance status and screening behavior.

Also, the BRFSS data was obtained through telephone interview, which increases the risk of selection bias. For example, only women with landline phones are eligible to participate, which could disproportionately exclude women with lower socioeconomic status. Also, the sampling scheme in BRFSS does not include institutionalized residents or members of the military.

Issues of recall bias could also influence the results. Further, most women know that the socially desirable response is to report having screening. Therefore, the self-report of breast and cervical cancer screening could be over-reported. Also, women could "telescope" and report that their screening was done more recently than it actually was.

In addition, the number of EWL screening and diagnostic providers may be underreported from the EWL administrative sites, which may lead to an underestimation of the areas covered by EWL. EWL also provides diagnostic services for women between the ages of 18-64 with abnormal screenings. Also, because this study only examined EWL clients between the ages of 40-64, the true need for diagnostic sites may be underestimated.

Conclusions

Disparities in breast and cervical cancer screening still persist among insured and uninsured women living in Virginia. With the growing amount of uninsured Americans, it is important to find ways of increasing the amount of breast and cervical cancer screenings according to national recommendations in order to ensure early detection as well as timely diagnosis and treatment of cancer. EWL stands to play an important part in helping uninsured women attain screening rate objectives set by Healthy People 2010. However, more screening and diagnostic providers are needed in Virginia to meet the screening and diagnostic needs of Virginia's EWL population.

Tables

Table 1: Sample Baseline Characteristics of Virginia Women Ages 40-64. (N=1,627)

Variable of Interest	Unweighted n	Weighted Percent
Race		
White (non-Hispanic)	1,268	82.6
Black	408	14.2
Other	36	3.2
Age		
40-49	676	48.2
50-64	951	51.8
Income		
Less than $20,000/year	133	5.3
Greater than $20,000/year	1,384	94.5
Education		
Less than High School	635	34.6
Greater than High School	987	65.4
Insurance		
Insured	1,442	89.8
Uninsured	184	10.2
Married	1,617	63.6
Excellent Health	352	26.4

Table 2: Unadjusted and Adjusted Screening Rates of Virginia Women Ages 40 to 64 by Insurance Status (N=1,627).

Screening	Unadjusted			Adjusted [1]		
	Insured (n= 1,442)	Uninsured (n= 184)		Insured (n= 1,442)	Uninsured (n= 184)	
	Percent (95% CI)	Percent (95% CI)	p-value	Percent (95% CI)	Percent (95% CI)	p-value
Ever had Mammogram	93.0 (91.6, 94.5)	78.6 (72.4, 82.8)	<0.0001	92.5 (90.5, 93.5)	76.8 (74.1, 83.4)	<0.0001
Ever had Pap Smear	99.9 (99.1, 100)	99.8 (97.7, 99.9)	0.2730	99.7 (99.1, 99.9)	97.9 (97.8, 99.8)	0.1750
Mammogram in Last 2 years	79.4 (77.2, 81.6)	52.7 (46.4, 59.0)	<0.0001	79.3 (42.1, 57.9)	47.5 (72.7, 83.1)	<0.0001
Pap Smear in Last 3 Years [2]	88.4 (86.7, 90.2)	67.5 (62.3, 72.6)	<0.0001	88.0 (85.2, 93.0)	57.6 (60.0, 71.8)	<0.0001

1 Adjusted for age, race, education and income.
2 Women with hysterectomy were excluded from these analyses.

Table 3. Percent of Virginia Women Ages 40 to 64 Receiving Screening per Recommendations by Health District. [1] (N=1,627).

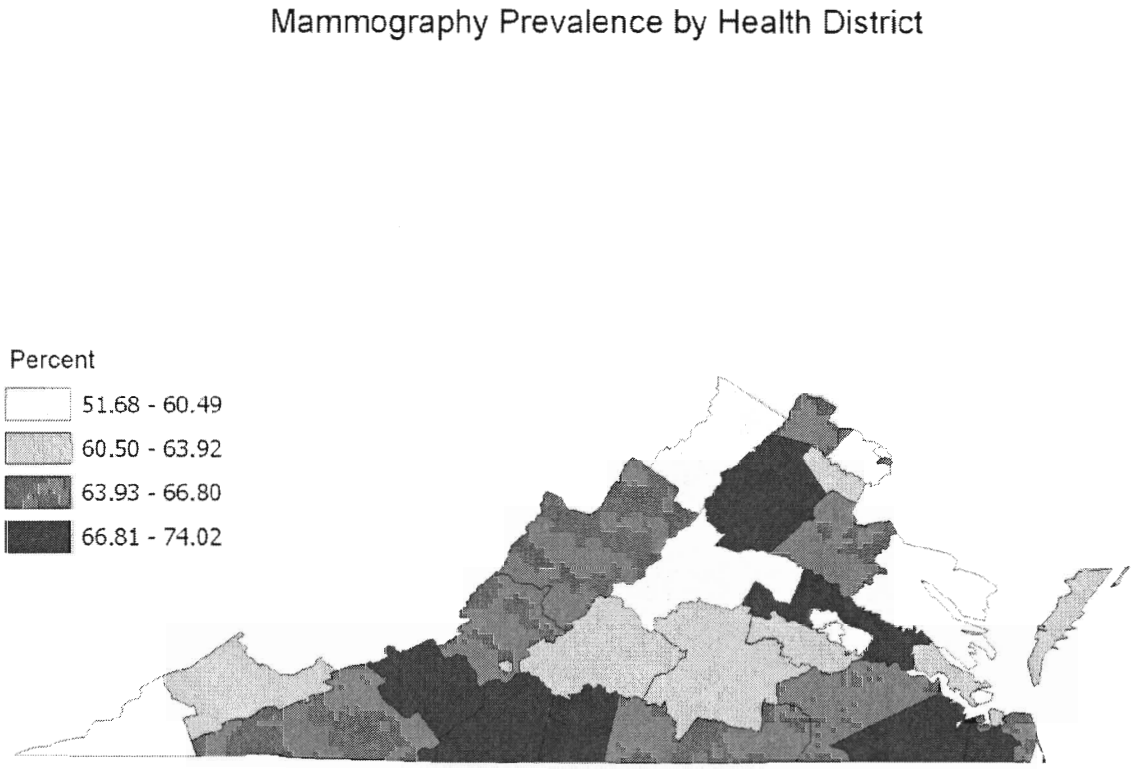
Health District	Mammography in Last 2 Years Percent (95% CI)	Pap Smear in Last 3 Years [2] Percent (95% CI)
Central Shenandoah	68.8 (56.4, 81.2)	76.2 (66.5, 85.9)
Lord Fairfax	54.1 (38.1, 70.1)	69.6 (57.1, 82.2)
Rappahannock	66.5 (54.7, 78.4)	78.9 (69.0, 88.7)
Rappahannock/Rapidan	74.0 (56.3, 78.4)	70.15 (55.4. 84.9)
Thomas Jefferson	57.5 (43.5, 71.5)	74.35 (62.8, 85.9)
Alexandria	65.1 (44.5, 85.7)	75.96 (59.9, 92.0)
Arlington	57.4 (39.5, 75.2)	80.9 (67.4, 94.5)
Fairfax	55.4 (47.7, 63.0)	77.8 (71.2 ,84.4)
Loudon	66.0 (52.5, 79.6)	72.4 (61.6, 83.2)
Prince William	63.8 (51.46, 76.1)	78.72 (69.1, 88.3)
Alleghany	66.4 (52.6, 80.2)	64.73 (53.8, 75.6)
Central Virginia	63.9 (49.0, 78.9)	70.64 (59.3, 82.0)
Cumberland Plateau	61.78 (47.3, 76.2)	55.91 (43.9, 68.0)
Pittsylvania/Danville	66.81 (48.1, 85.6)	72.64 (56.0, 89.3)
West Piedmont	68.41 (52.3, 84.6)	78.87 (66.0, 91.7)
Lenowisco	60.35 (41.4, 79.3)	74.28 (57.7. 90.9)
Mount Rogers	66.67 (54.1,79.2)	57.7 (47.3, 68.1)
New River	67.8 (52.9, 72.81)	66.06 (55.2, 77.0)
Roanoke	61.2 (40.1, 82.4)	80.0 (62.3, 97.8)
Chesterfield	62.85 (52.9, 72.81)	72.3 (63.5, 81.2)
Crater	66.13 (50.8, 81.49)	80.0 (64.2, 95.9)
Hanover (Chikohomony)	72.2 (57.5, 87.0)	73.4 (61.3, 85.4)
Henrico	59.8 (47.4, 72.2)	79.2 (68.6, 89.8)
Piedmont	63.3 (42.8, 83.8)	84.4 (65.5, 100)
Richmond	60.49 (41.1, 79.8)	84.5 (68.2, 100)
Southside	66.6 (44.3, 89.0)	82.9 (64.8, 100)
Chesapeake	72.9 (58.1, 87.7)	68.1 (56.1, 80.2)
Eastern Shore	63.1 (38.7, 87.5)	69.6 (50.1, 89.2)
Hampton	59.45 (39.5, 79.4)	68.1 (50.5, 85.7)
Norfolk	61.15(43.5, 78.9)	72.0 (57.9, 86.2)
Three Rivers	51.68 (37.3, 66.0)	67.9 (56.2, 79.6)
Peninsula	63.55 (50.4, 76.7)	63.4 (51.7, 75.1)
Western Tidewater	73.96 (59.0, 88.9)	75.0 (61.7, 88.4)
Virginia Beach	66.8 (55.8, 77.8)	75.6 (65.9, 85.2)
Portsmouth	65.29 (46.5, 84.1)	75.6 (60.9, 90.2)

1 Adjusted for age, race, education, insurance, and income.
2 Women with hysterectomy were excluded from these analyses.

Table 4. Sample Characteristics of 2005 Every Woman's Life Clients (N=4,959).

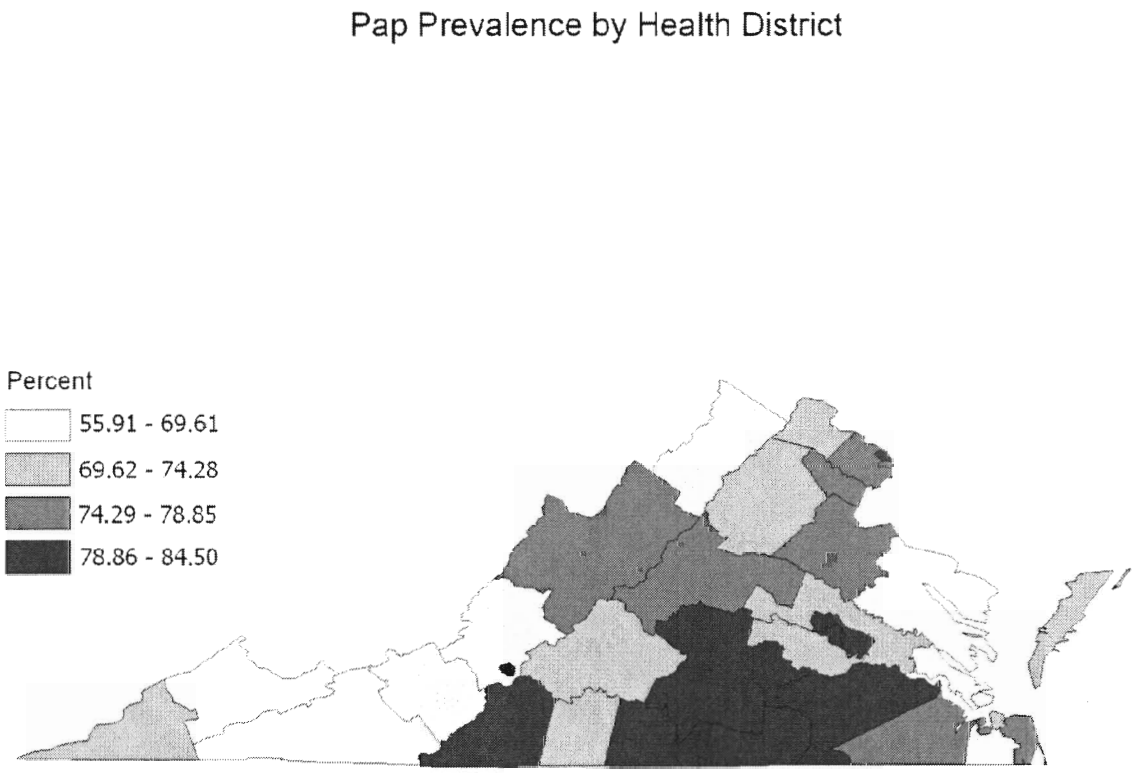
Variable	n	Percent
Race		
White	2,798	56.4
Black	1,756	35.4
Other	405	8.2
Age		
40-49	702	14.2
50-64	4,257	85.8
Language		
English	4,593	92.6
Spanish	188	3.8
Other	178	3.6

Figure 1. Prevalence of Having a Mammogram in the Last Two Years Among Women Ages 40 to 64 by Health District. [1] (N=1,627).



1 Adjusted for age, race, education, income, and insurance status.

Figure 2. Prevalence of Having a Pap Smear in the Past Three Years Among Women Ages 40 to 64 by Health District. [1, 2] (N=1,627)



1 Adjusted for age, race, education, income, and insurance status.
2 Women with hysterectomy were excluded from these analyses.

Figure 3. Pap Screening Sites and Every Woman's Life (N=4,959) Clients by Zip Code.

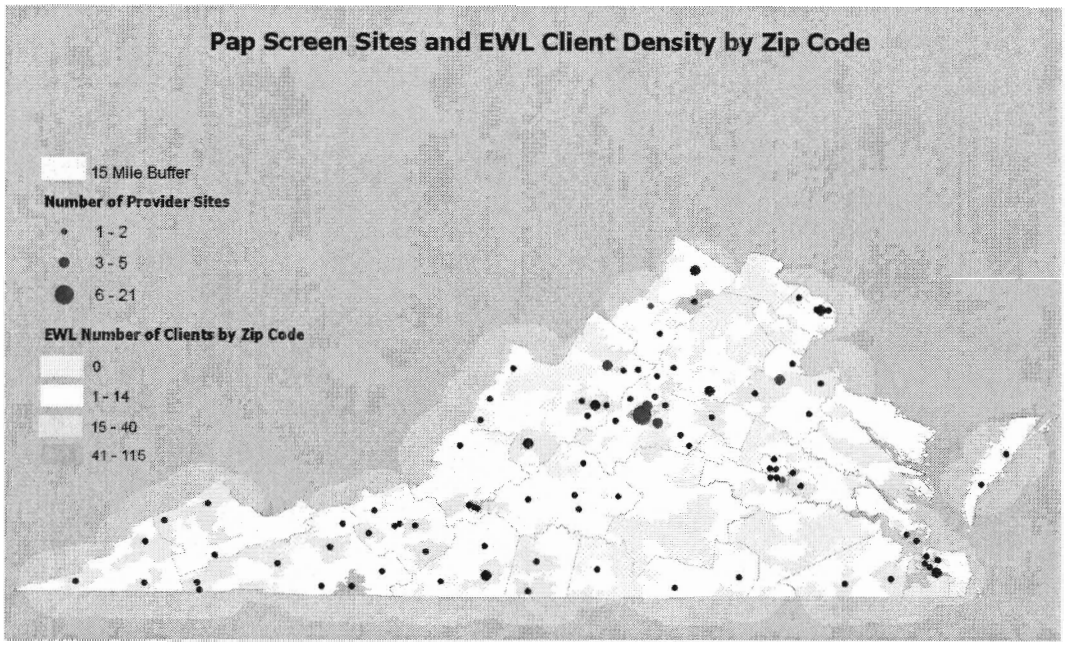


Figure 4. Pap Diagnostic Sites and Every Woman's Life (N=4,959) Clients by Zip Code.

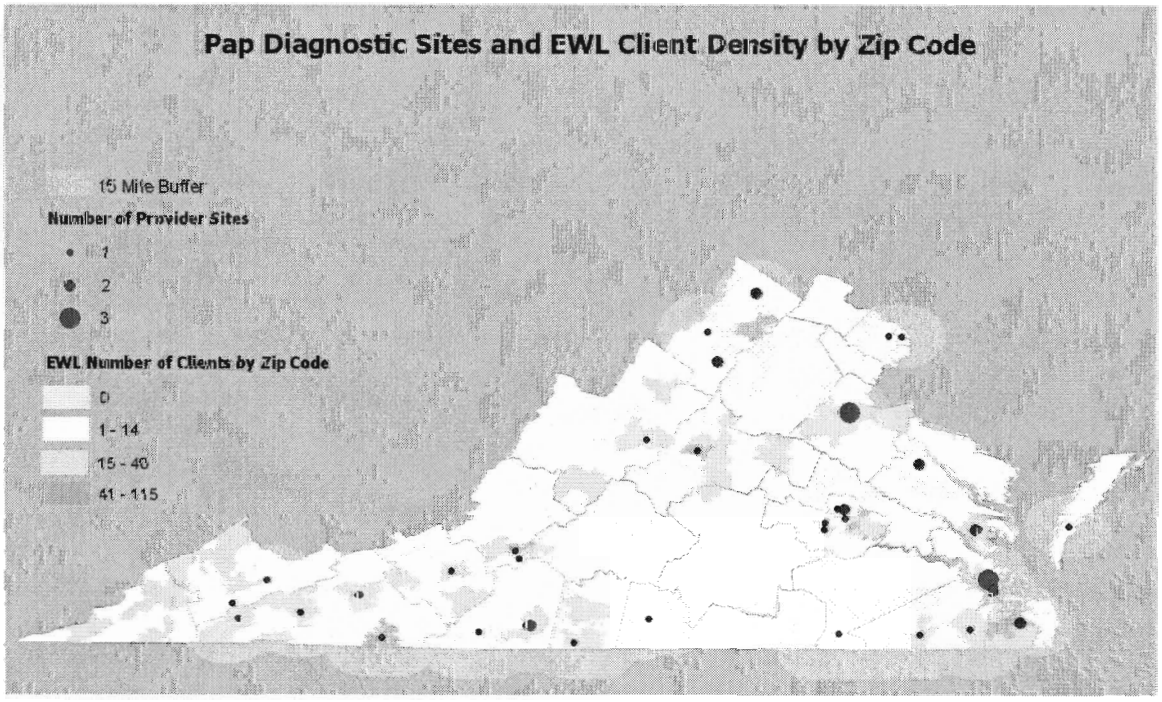


Figure 5. Mammography Screening Sites and Every Woman's Life (N=4,959) Clients by Zip Code.

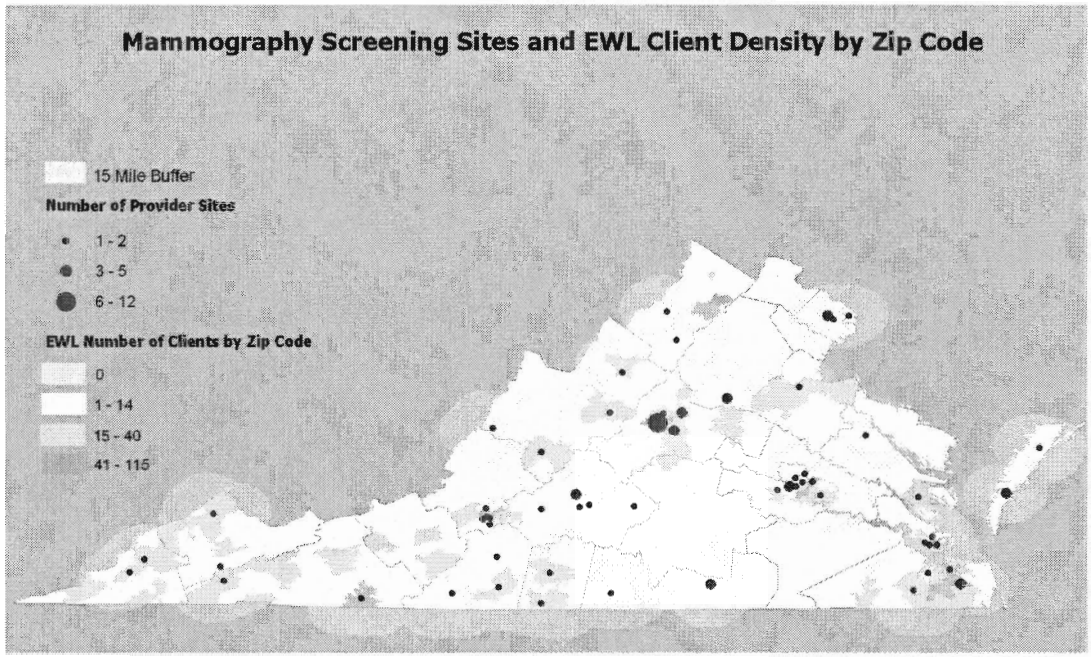
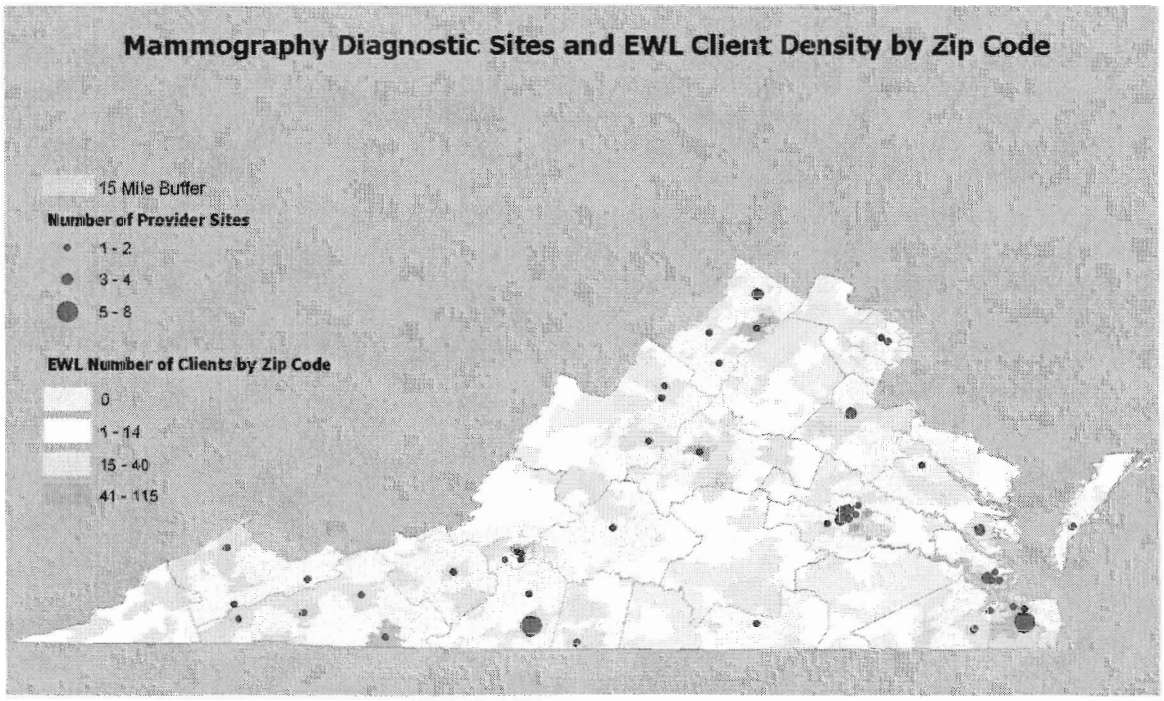


Figure 6. Mammography Diagnostic Sites and Every Woman's Life (N=4,959) Clients by Zip Code.



References

American Cancer Society (2006) Cancer Facts and Figures 2006. Atlanta GA.

Blair SL, Sadler GR, Bristol R, Summers C, et al. (2006). Early detection among rural and urban Californians. BMC Public Health. 6:194-199.

Bradley CJ, Given CW, Roberts C (2001). Disparities in cancer diagnosis and survival . Cancer. 91(1): 178-188.

Carruth AK, Browning S, Reed DB, et al. (2006). The Impact of Farm Lifestyle and Health Characteristics: Cervical Cancer Screening Among Southern Farmwomen. Nursing Research. 55(2): 121-127.

Casey MM, Call KT, Klinger JM (2000). Are rural residents less likely to obtain recommended preventive health services? American Journal of Preventive Medicine. 21(3):182-188.

Coughlin SS, Thompson TD, Hall HI, et al. (2002). Breast and cervical carcinoma screening practices among women in rural and nonrural areas of the United States 1998-1999. Cancer. 94 (11): 2801-2812.

Coughlin SS, Uhler RJ, Bobo JK, Caplan L. (2004). Breast cancer screening practices among women in the United States, 2000. Cancer Causes Control. 15 (2): 159-170.

Centers for Disease Control and Prevention. NBCCEDP Screening Program Summaries. Retrieved March 6, 2007 from the World Wide Web: http://www.cdc.gov/cancer/nbccedp/sps/profiles/national_aggregate.htm.

Centers for Disease Control and Prevention. Overview BRFSS 2005. Retrieved May 5, 2007 from the World Wide Web: http://www.cdc.gov/brfss/technical_infodata/surveydata/2005/overview_05.rtf.

Eheman CR, Benard VB, Blackman D, et al. (2006). Breast cancer screening among low-income or uninsured women: results from the National Breast and Cervical Cancer Early Detection Program, July 1995-March 2002. Cancer Causes Control. 17 (1): 29-38.

Engelman KK, Hawley DB, Gazaway R, Mosier MC, Ahluwalia JS, Ellerbeck, EF. (2002). Impact of Geographic Barriers on the Utilization of Mammograms by Older Rural Women. Journal of the American Geriatrics Society. 50(1):62–68.

Hall, HI, Uhler RJ, Coughlin SS, Miller DS. (2002). Breast and Cervical Cancer Screening among Appalachian Women. Cancer Epidemiology and Biomarkers & Prevention. 11:137-142.

Hiatt RA, Klabunde C, Breen N, Swan J, Ballard-Barbash R. (2002). Cancer screening practices from the National Health Interview Surveys: Past present and future. J Natl Cancer Inst. 94:1837-1846.

Kerlikowske K, Grady D, Rubin SM, et al. (1995). Efficacy of screening mammography. A meta-analysis. JAMA. 273:149-154.

Kreher NE, Hinkner JM, Rufin MT, Lin CH. (1995). Effect of distance and travel time on rural women's compliance with screening mammography: the UPRNet study. J Fam Pract. 40: 143–7.

Lantz PM, Mujahid M, Schwartz K, et al. The Influence of Race, Ethnicity, and Individual Socioeconomic Factors on Breast Cancer Stage at Diagnosis (2006). American Journal of Public Health. 96(12): 2173-2179.

Lawson HW, Henson R, Bobo JK, Kaeser MK. (2000). Implementing recommendations for the early detection of breast and cervical cancer among low-income women. MMWR. 1;49(2):37-55.

Litaker D, Tomolo A. (2007). Association of Contexual Factors and Breast Cancer Screening: Finding New Targets to Promote Early Detection. Journal of Women's Health. 16 (1): 36-45.

McCarthy EP, Burns RB, Freund KM, et al. (2000). Mammography use, breast cancer stage at diagnosis, and survival among older women. J Am Geriatr Soc. 48: 1226-1333.

McElroy JA, Remington PA, Gangnon RE, et al. (2006). Identifying Geographic Disparities in the Early Detection of Breast Cancer using a Geographic Information System. Preventing Chronic Disease. 3(1): 1-8.

Makuk DM, Breen N, Fried V (1999). Low income, race, and the use of mammography. Health Serv Res. 34: 229-239.

Mandelblatt JS, Andrews H, Kerner JF, et al. (1991). Determinants of late state diagnosis of breast and cervical cancer: The impact of age, race, social class, and hospital type. The American Journal of Public Health. 81:646-9.

Marchick J, Henson DE. (2005). Correlations between access to mammography and breast cancer stage at diagnosis. Cancer. 103(8): 1571-1580.

O'Malley AS, Forrest CB, Mandelblatt J. (2002). Adherence of Low-Income Women to Cancer Screening Recommendations: The Role of Primary Care, Health Insurance, and HMOs. Journal of General Internal Medicine. 17:144-154.

Oluwole SF, Ali AO, Adu A, et al. (2003). Impact of cancer screening program on breast cancer stage at diagnosis in a medically underserved community. J Am Coll Surg. 196:180-188.

Phillips KA, Kerlikowske K, Baker LC, et al. (1998). Factors associated with women's adherence to mammography screening guidelines. Health Services Research. 33(1):29-53.

Qureshi M, Thacker HL, Litaker DG, Kippes C. (2000). Differences in breast cancer screening rates: an issue of ethnicity or socioeconomics? J Womens Health Gend Based Med. 9:1025–1031.

Roetzheim RG, Naazneen P, Tennant O, et al. (1999). Effects of health insurance and race on early detection. J Natl Cancer Inst. 91:1409-15.

SAS Institute, Inc. (1996). SAS/STAT Software: Changes and Enhancements, through Release 6.11. Cary, NC: SAS Institute, Inc.

Schootman M, Fueortes LJ. (2000). Breast and cervical carcinoma: The correlation of activity limitations and rurality with screening, disease incidence, and mortality. Cancer. 86(6): 1087-1094.

Selvin E, Brett KM. (2003). Breast and Cervical Cancer Screening: Sociodemographic Factors among White, Black, and Hispanic Women. American Journal of Public Health. 93(4): 616-623.

Somkin CP, McPhee SJ, Nguyen T, Stewart S, Shema SJ, Nguyen B, Pasick R. (2004). The Effect of Access and Satisfaction on Regular Mammogram and Papanicolaou Test Screening in a Multiethnic Population. Medical Care. 42(9):914-926.

Swan J, Breen N, Coates RJ, et al. (2003). Process in cancer screening practices in the United States: Results from the 2000 National Health Interview Survey. Cancer. 97: 1528-1540.

Tangka FKL, Dalaker J, Chattopadhyay SK, et al. (2006). Meeting mammography screening needs of underserved women: the performance of the National Breast and Cervical Cancer Early Detection Program in 2002-2003. Cancer Causes Control. 17:1145-1154.

U.S. Department of Health and Human Services. (2003). Healthy People 2010, 2nd ed. U.S. Government Printing Office, Washington, DC.

U.S. Department of Health and Human Services (2006). Health Resources and Services Administration, Rockville, Maryland: U.S. Department of Health and Human Services.

U.S. Preventative Services Task Force (2005a). Screening for breast cancer: recommendations and rationale. In: Guide to Clinical Preventive Services: Periodic Updates. 3rd ed. Agency for Healthcare Research and Quality. Rockville, MD.

U.S. Preventative Services Task Force (2005b). Screening for cervical cancer: recommendations and rationale. In: Guide to Clinical Preventive Services: Periodic Updates. 3rd ed. Agency for Healthcare Research and Quality. Rockville, MD.